

## **VI. Considerations and Limitations**

In the course of performing this year's Actuarial Review, the following limitations and issues have been identified for consideration or possible additional investigative analyses:

- Model responsiveness to changing economic conditions.

The actuarial models used for this study are based on econometric regression techniques. The forecasts of economic values and capital ratios have been shown to be driven by several key economic variables that have been incorporated into the actuarial models. However, these models are not time series models and are therefore dependent upon the forecasts of future values of the economic variables. The parameter calibration of these models reflects a wide variety of economic conditions over the past 25 years and therefore the forecasts presented in this study are long term in nature as is appropriate given the long term cash flows involved.

Short term variations in MMIF claims or prepayment rates are not predicted by these models nor are other variables, such as delinquencies. It is not clear what conditions would cause such short term variations to have a significant influence on the long term forecasts. Further study in such short term variations is challenged by a lack of data availability and data consistency. However, the adjustments used in this study were based on testing short term variations from recent years and considering the possible effect on long term cash flows. Because such short term variation may indicate significant adverse long term effects, these variations, and their potential causes, should be considered in future actuarial studies.

- Using the model to predict fiscal period claims and prepayments.

As discussed above in regard to model responsiveness, the actuarial models used for this study were not intended to predict short term claims and prepayments for each fiscal period. Additional variables may be needed to predict short term results, but those additional variables would also need to be predicted or modeled.

Further study of short term forecasts should be included in future annual actuarial studies to assess the potential for deterioration in the Fund's capital ratio, or other adverse indications, that might be predicted by short term variables. A first step was included in this study, i.e., an investigation of various short term fiscal period levels of claims and prepayments compared to the model forecasts.

- Using detailed regional economic data by geographic statistical code in the regression model but using countrywide economic data for the forecast period.

There have been questions posed regarding the potential impact of how differences in regional economic conditions, and the related forecasts of regional economic variables, might affect the forward projections of claims and prepayment rates, and possibly loan demand.

Investigation into these questions would require an expanded scope of work due, in part, to the significant amount of data which has not previous been compiled by any type of regional breakdown for the actuarial studies to date. Also, not all of the elements of the current models could be completed at the regional level of detail, so appropriate methods would need to be developed and tested.

In this study, preliminary work was included on a loan-by-loan model that incorporates regional economic forecasts into the projection periods. Results of this model will be discussed in a supplemental report.

- Using borrower credit rating data in the actuarial models.

There have been concerns that borrower characteristics should be reflected in the actuarial models. This could be particularly important as a book of business ages and the predictability of claims and prepayments could be affected by changes in borrower credit ratings. Also, the introduction of the OY1995 variable in the CCR model improved the actual versus fitted results, but this additional variable does not explain why there was a shift in the claim rates or whether that change will continue for the future. Furthermore, the introduction of an adjustment factor for OY2000 is an additional indication that some other factor is influencing the claim and prepayment activity.

Because of changes in borrower credit requirement that affected OY1995, it is suspected that there was greater availability of FHA mortgages to more borrowers with lower credit ratings than in previous years. The actuarial models do not include a variable that reflects borrower credit ratings, and therefore it is possible that the under-prediction of claims could be reflective of this change.

Also of concern is the effect of OY2000's high prepayments because of the possibility of lower average credit rating of the remaining borrowers. To the extent that such a variable did change significantly, the future claims and prepayments may be much different than forecasted for that book of business.

It may be possible to improve the predictability of future claims and prepayments by introducing one or more variables that reflect borrower credit rating. However, credit variables are not available within HUD's database and it would require extensive data mining from external credit databases to obtain sufficient data to build and test actuarial models using credit information. Consequently, investigative studies are suggested using samples from HUD's database matched to external credit information on individual loans.

- Interpretation of the how high the capital ratio should be before introducing reduced premiums, distributive shares or other features.

Investigations into this issue should involve exploration of various actuarial metrics for assessing the strength of the capital ratio, particularly in terms of the viability of the Fund to withstand prolonged adverse economic conditions.

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- Review whether the loan demand model could be enhanced to incorporate the distribution of loans across loan type, LTV category, and region, possibly to predict changes in the FHA share of the mortgage market.

If HUD wishes to incorporate some of these suggestions into future actuarial reviews, appropriate modification to the scope of the actuarial review will be needed.